

WELCOME

Hands-On Science with OpenUniverse2024 Roman and Rubin Simulations

15 September 2026

AGENDA

0:00–0:15	What Is OpenUniverse2024?
0:15–0:30	Introduction to Fornax
0:30–0:50	Accessing OpenUniverse2024 Data
0:50–1:05	Visualizing OpenUniverse2024 Data
1:05–1:30	Self-paced tutorial exploration <i>everyone is on hand for questions</i>

Workshop website



What is OpenUniverse2024?

A matched, simulated view of one patch of sky — as Roman and Rubin will each see it

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OpenUniverse et al. 2025, arXiv:2501.05632 · ~400 TB, public

The interesting problems are joint problems

Transient identification and photometry

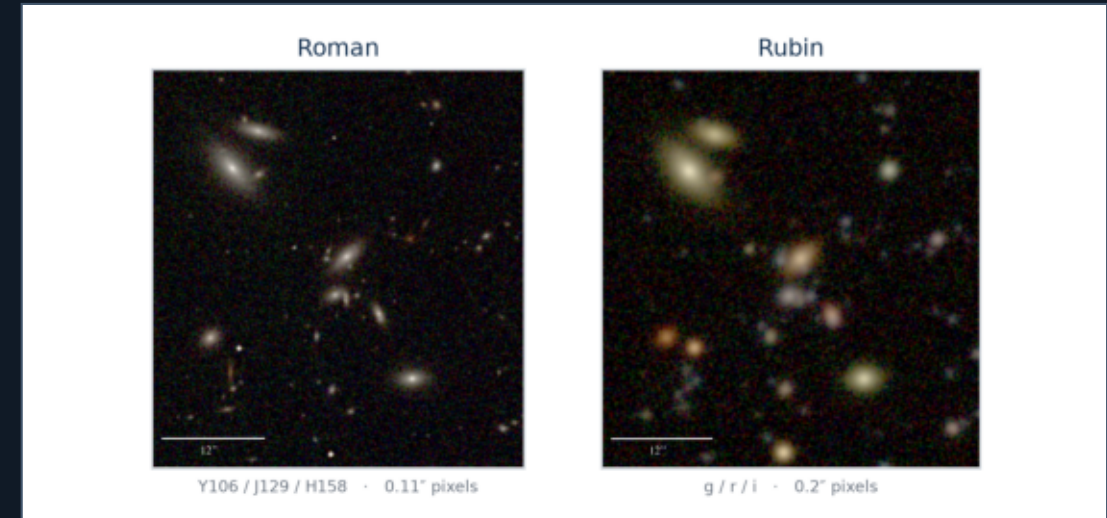
Type Ia supernovae are standard candles — their light curves give the distances that trace cosmic expansion.

- Pipelines are needed well before data starts flowing from the observatories — the survey has to find transients from day one.
- Simulations are critical for informing observing strategy.
- Light curves measured from image subtraction match the light curve that was injected, to about 1%.

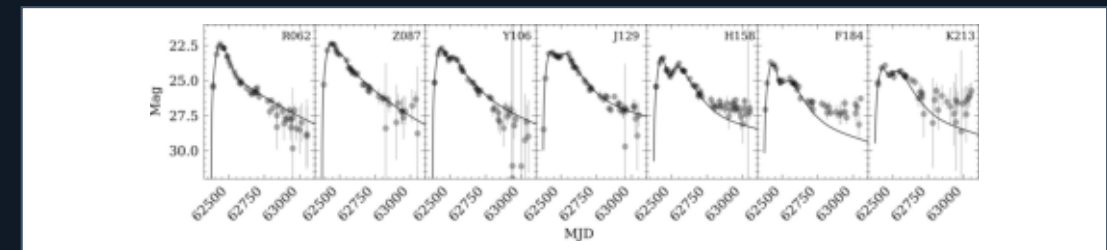
Lens sample selection

Dark energy studies of cosmic shear, galaxy-galaxy lensing and galaxy clustering rely on simulations like these.

- Which galaxies go into the chosen galaxy samples for these works directly changes the clustering and lensing signals.
- It is important to optimize sample size to both reduce shot noise and have high redshift accuracy.
- OpenUniverse2024 enables exploring different samples based on realistic colors from both LSST optical and Roman near-infrared.



one field, two observatories — Fig. 10 of the paper



SN Ia 20172782 recovered from image subtraction — Fig. 16

All of it needs one sky rendered twice — the same galaxies, the same lensing field, the same transients.

WHAT WAS SIMULATED

Two surveys, one $\sim 70 \text{ deg}^2$ field

CATALOGS

- Diffsky galaxy truth catalog — 117 M objects over 111 deg^2 ; Roman and Rubin overlap on $\sim 70 \text{ deg}^2$ of it.
- SNANA (Supernova Analysis) transient truth catalog — 1.35 M events.

IMAGES

- Rubin Legacy Survey of Space and Time (LSST) — five years of the Wide-Fast-Deep survey in ugrizy on the v3.2 rolling cadence, plus the ELAIS-S1 Deep-Drilling Field.
- Roman High-Latitude Wide-Area Survey (HLWAS) — 16,956 exposures of 139.8 s, six filters Y106 to K213 plus the W146 wide filter.
- Roman High-Latitude Time-Domain Survey (HLTDS) — 12 deg^2 on ELAIS-S1, 57,365 exposures in seven filters of 101–901 s, 146 visits per filter every 5 days.



the same patch at full survey depth — Fig. 1

The datasets

s3://nasa-irsa-simulations/openuniverse2024/ anonymous, us-east-1 DOI 10.26131/IRSA569 (preview) · 10.26131/IRSA596 (full)

Catalogs

Truth tables

roman/full/roman_rubin_cats_v1.1.2_faint/

galaxy_<hp>.parquet

Diffsky galaxies, 117 M

galaxy_flux_<hp>.parquet

their broadband fluxes

galaxy_sed_<hp>.hdf5

rendered spectra, one per galaxy

pointsource_<hp>.parquet

Milky Way stars

pointsource_flux_<hp>.parquet

their broadband fluxes

snana_<hp>.parquet

1.35 M transients: type, z, host, params

snana_<hp>.hdf5

rendered realization: spectra + light curves

Rubin / LSST

rubin/full/, rubin/preview/

src_*.fits

per-visit source catalogs

sourceTable_*.parq

the same sources, as Parquet

deepCoadd_forced_src_*.fits

forced photometry on the coadds

Roman WAS & TDS

roman/full/RomanWAS/, RomanTDS/
images/<kind>/<filt>/<ptg>/

Roman_*_index_*.txt

objects on an image: id, x/y, flux, type

Roman_*_obseq_*.fits

one row per exposure — <ptg> is its index

Images

—

raw_*.fits.fz

uncalibrated detector readout

calexp_*.fits

calibrated single-visit images

deepCoadd_calexp_*.fits

coadded images

*Full release: single-frame products only,
all six bands. Raw data and the coadds are
in rubin/preview/ alone.*

Roman_*_truth_*.fits.gz

noiseless truth — the input sky

Roman_*_simple_model_*.fits.gz

calibrated single-epoch, with noise

prod_*_map.fits.gz

Pylmcom coadd, 0.039" — WAS only

*Coadds: five filters, Wide-Area Survey
only — none for the Time-Domain Survey,
and not yet searchable.*

<hp> is the healpix pixel number — nside 32, ring ordering; 33 tiles cover the field.